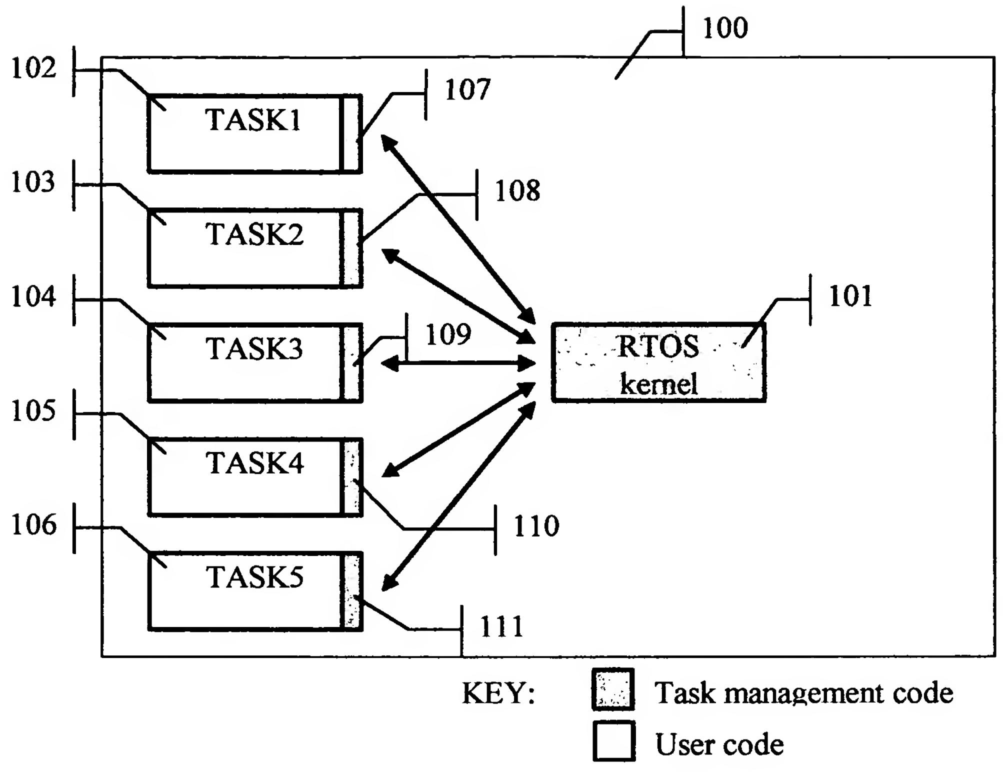

100
102
103
104
105
106
107
108
109
110
111
101
TASK1
TASK2
TASK3
TASK4
TASK5
RTOS kernel
KEY:
Task management code
User code

Figure 1

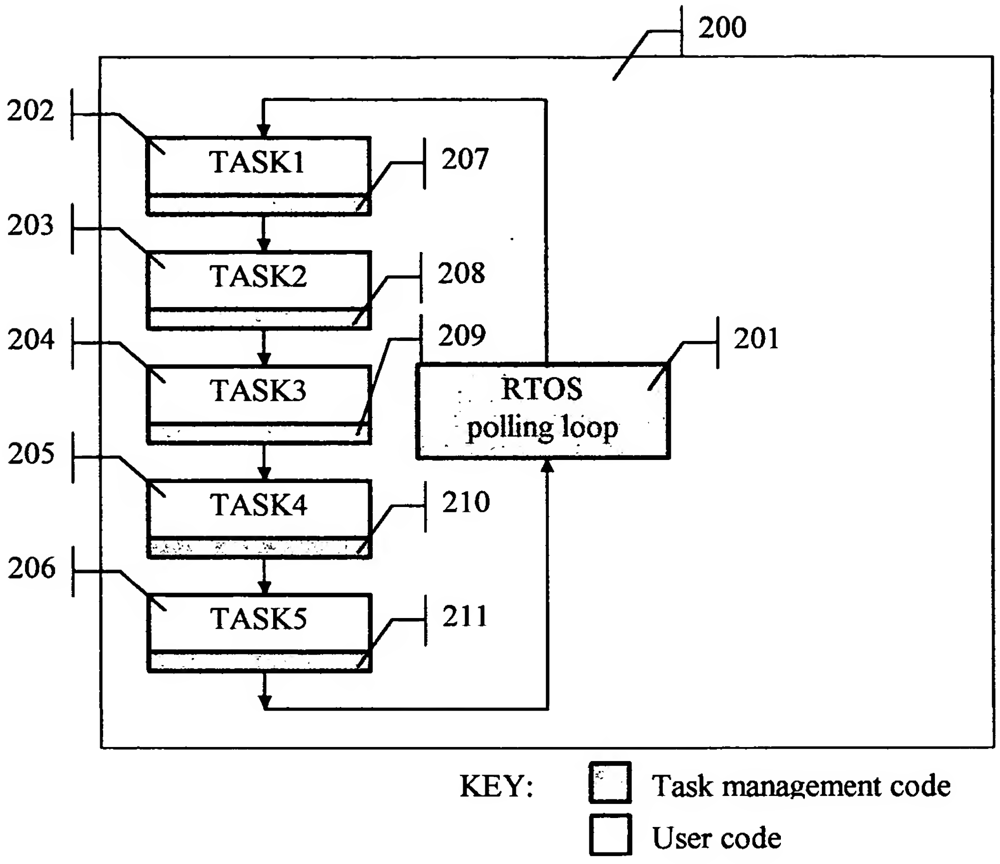
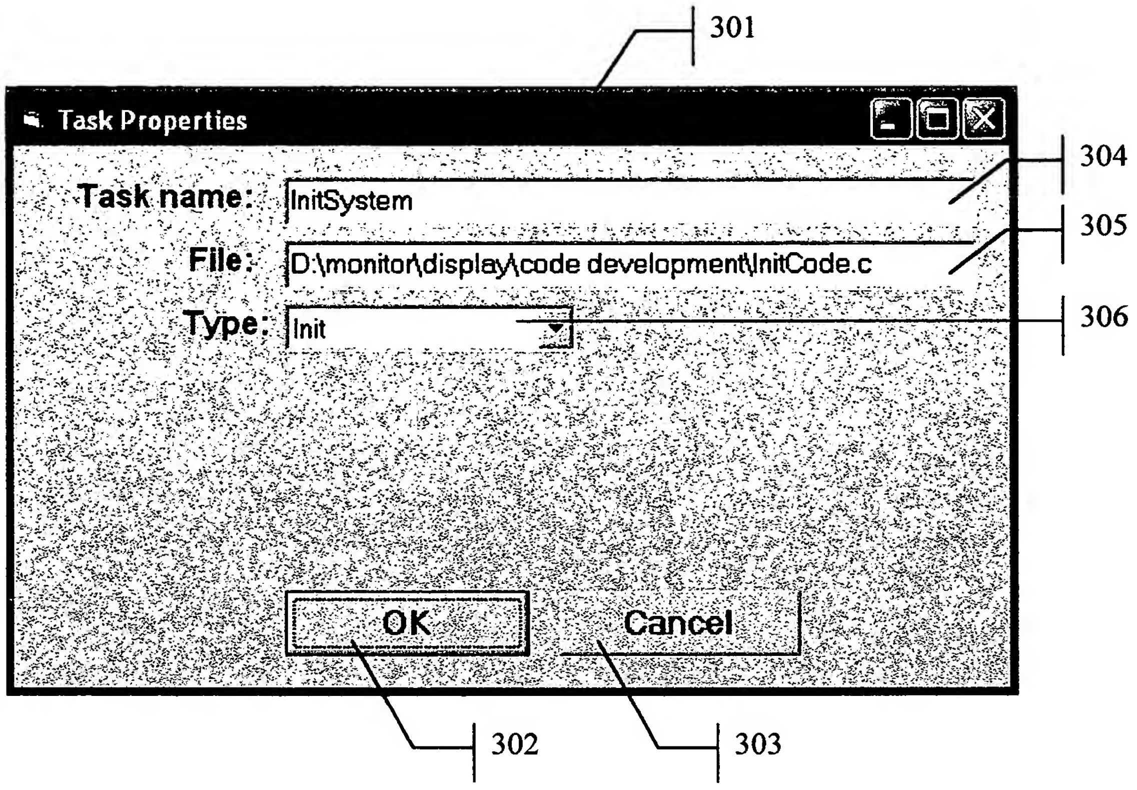

200
202
TASK1
207
203
TASK2
208
204
209
TASK3
RTOS polling loop
201
205
TASK4
210
206
TASK5
211
KEY:
Task management code
User code

Figure 2

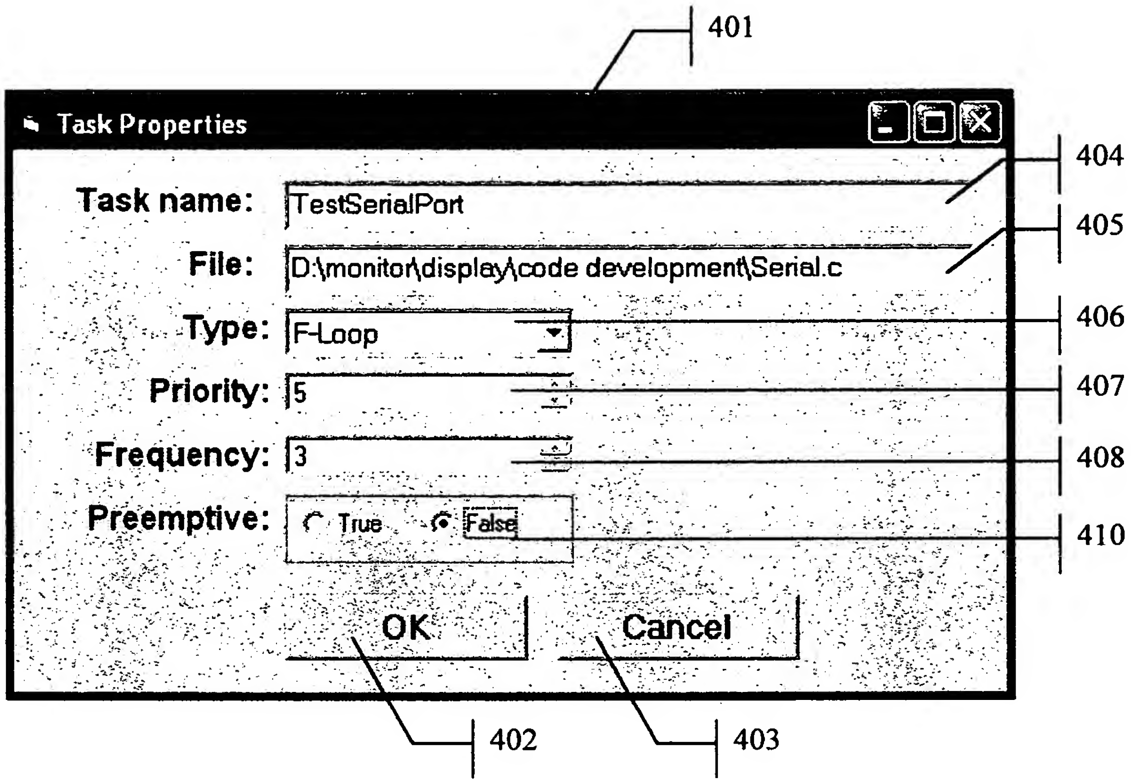

Task Properties

Task name: InitSystem

File: D:\monitor\display\code development\InitCode.c

Type: Init

Figure 3


Task Properties

Task name: TestSerialPort

File: D:\monitor\display\code development\Serial.c

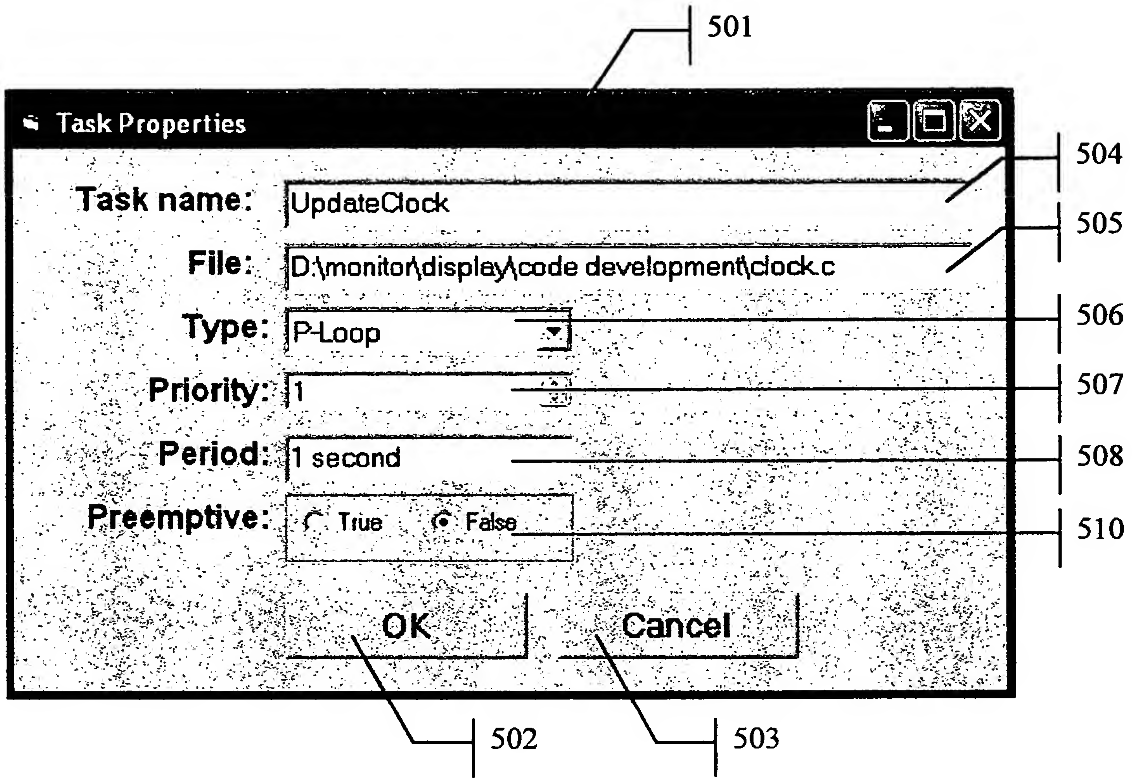
Type: F-Loop

Priority: 5

Frequency: 3

Preemptive: True [✓ False]

Figure 4



Task Properties

Task name: UpdateClock

File: D:\monitor\display\code development\clock.c

Type: P-Loop

Priority: 1

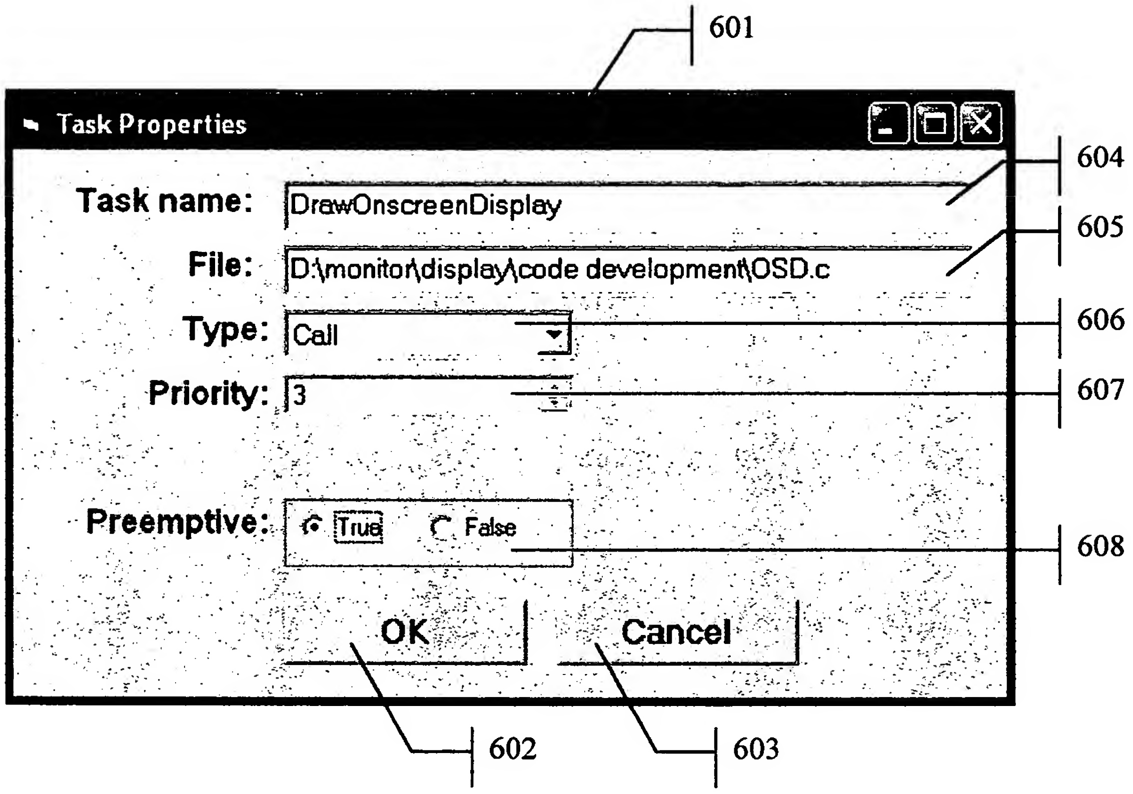
Period: 1 second

Preemptive: True [✓ False]

OK

Cancel

Figure 5


Task Properties

Task name: DrawOnscreenDisplay

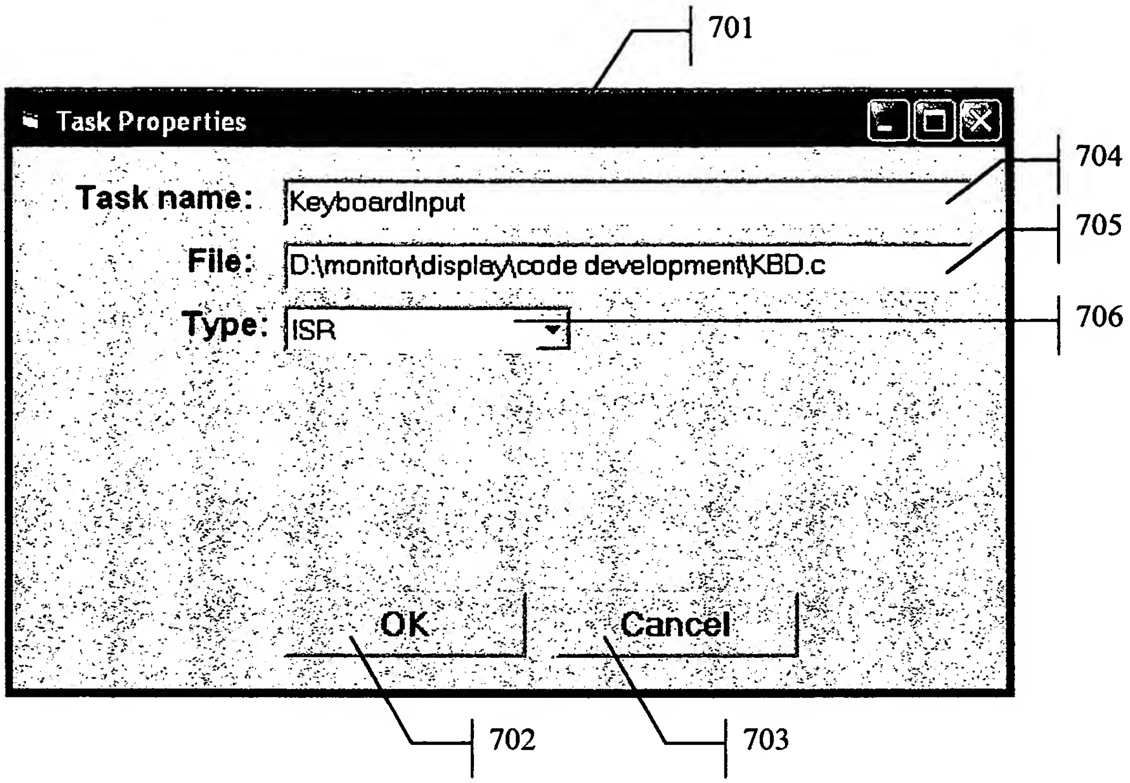
File: D:\monitor\display\code development\OSD.c

Type: Call

Priority: 3

Preemptive: [✓ True] False

Figure 6



Task name: KeyboardInput

File: D:\monitor\display\code development\KBD.c

Type: ISR

Figure 7

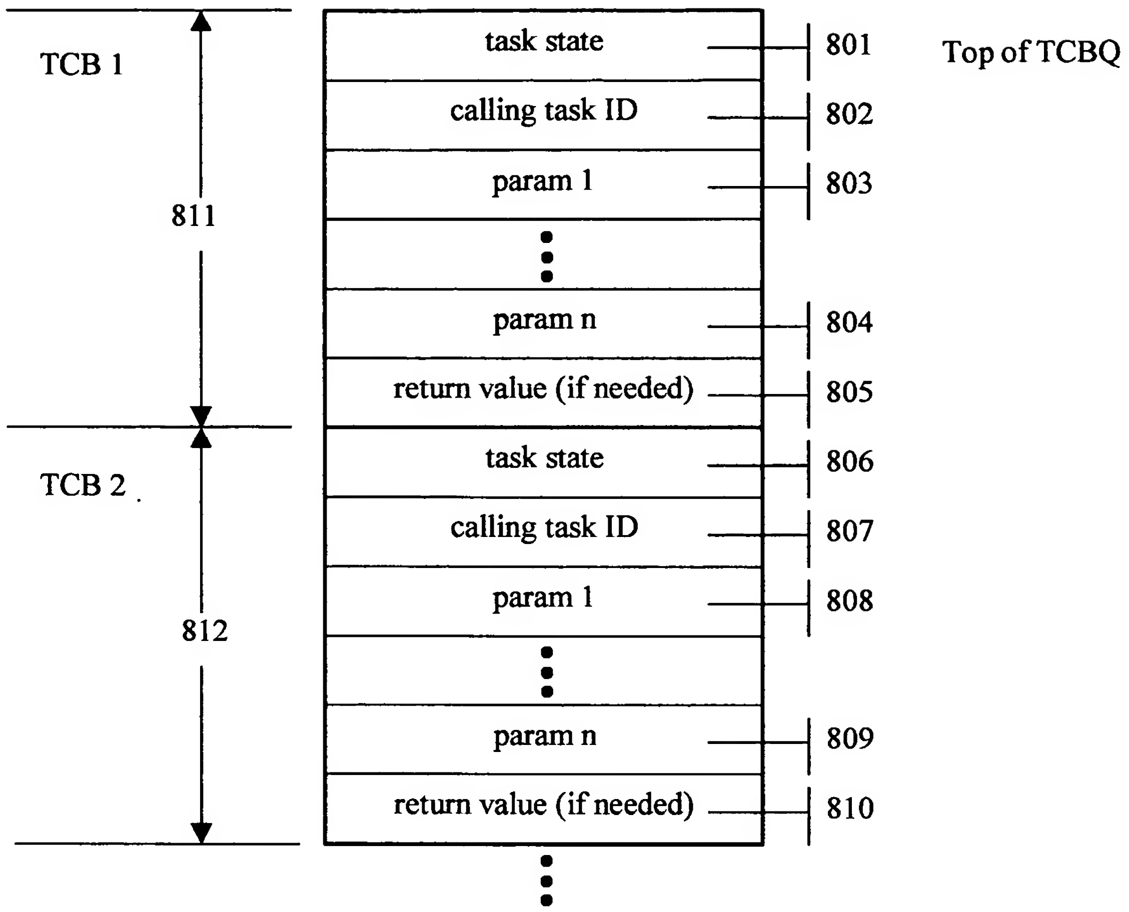


Figure 8

`SynthOS_X_write(SynthOS_taskx_TCBQ, n, x);`	Writes value x to n positions below top of TCBQ for task x
`SynthOS_X_write_next(SynthOS_taskx_TCBQ, x);`	Writes value x to next empty position in TCBQ for task x
`SynthOS_X_read(SynthOS_taskx_TCBQ, n, x);`	Reads value x from n positions below top of TCBQ for task x
`SynthOS_X_discard(SynthOS_taskx_TCBQ, n);`	Pops n locations off top of TCBQ, discards values popped, writes first location with 0

Figure 9

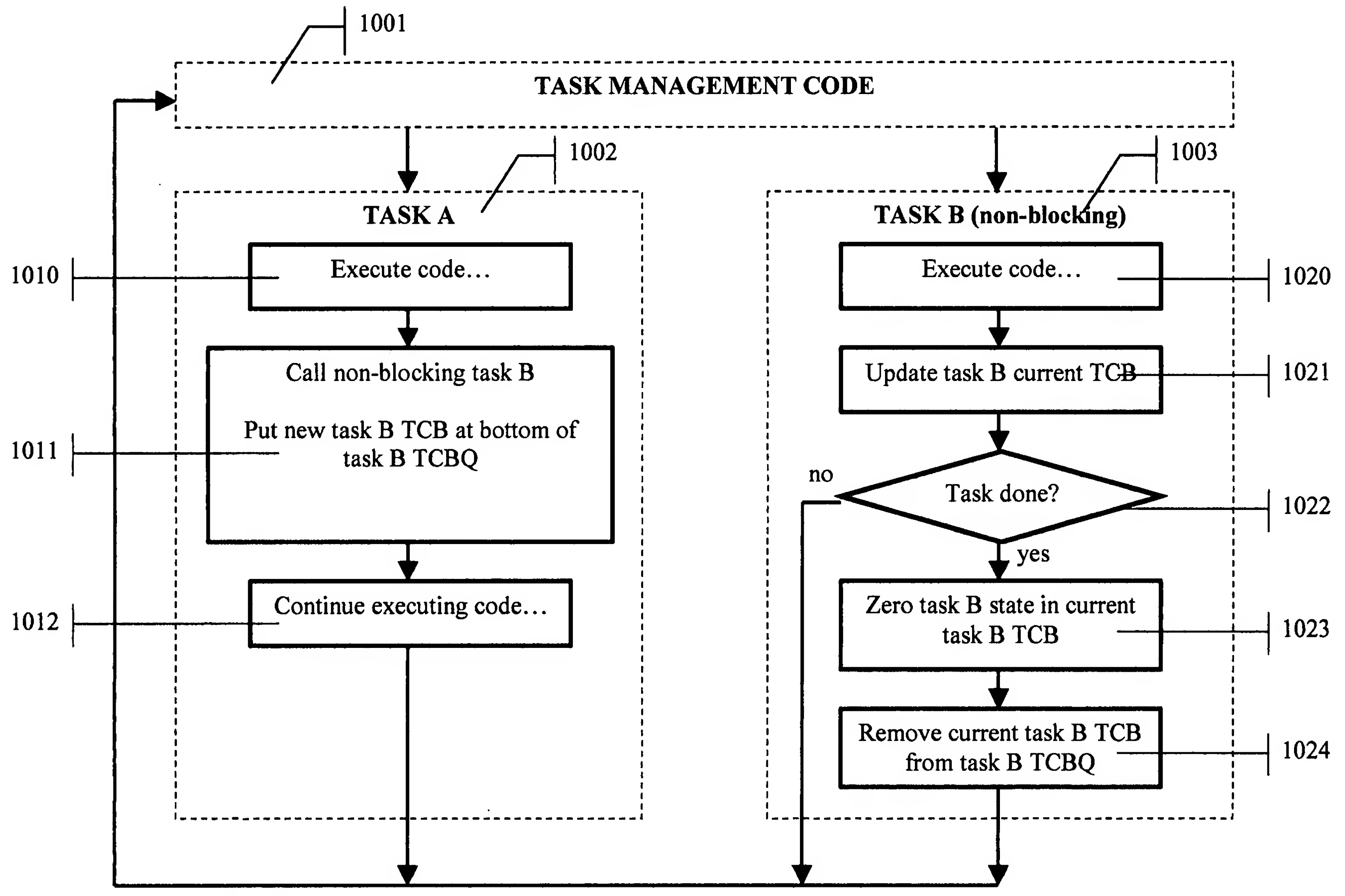

1001
TASK MANAGEMENT CODE
1002
1003
TASK A
TASK B (non-blocking)
1010
Execute code…
Execute code…
1020
Call non-blocking task B
Put new task B TCB at bottom of task B TCBQ
1011
Update task B current TCB
1021
no
Task done?
1022
yes
Continue executing code…
1012
Zero task B state in current task B TCB
1023
Remove current task B TCB from task B TCBQ
1024

Figure 10

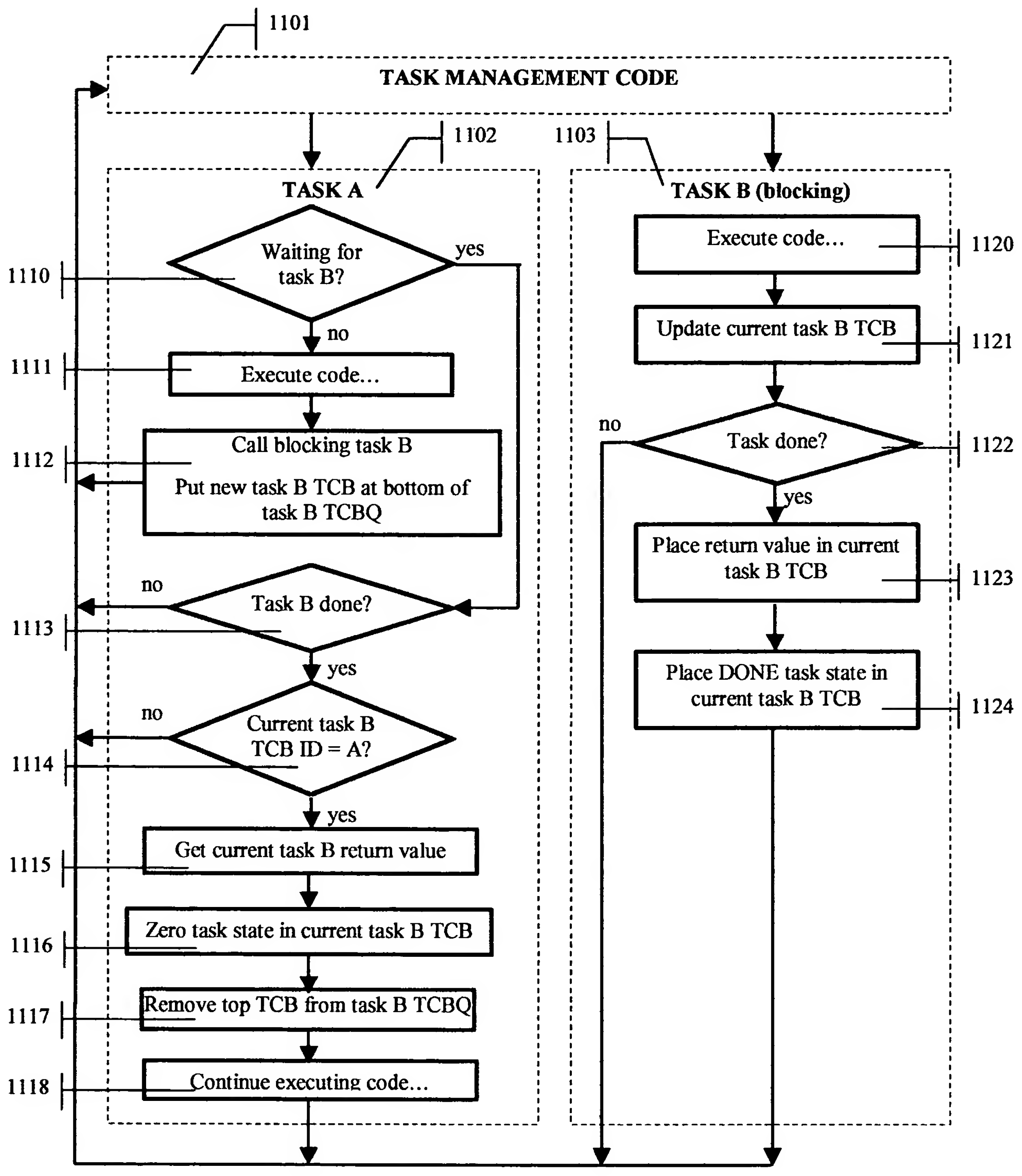
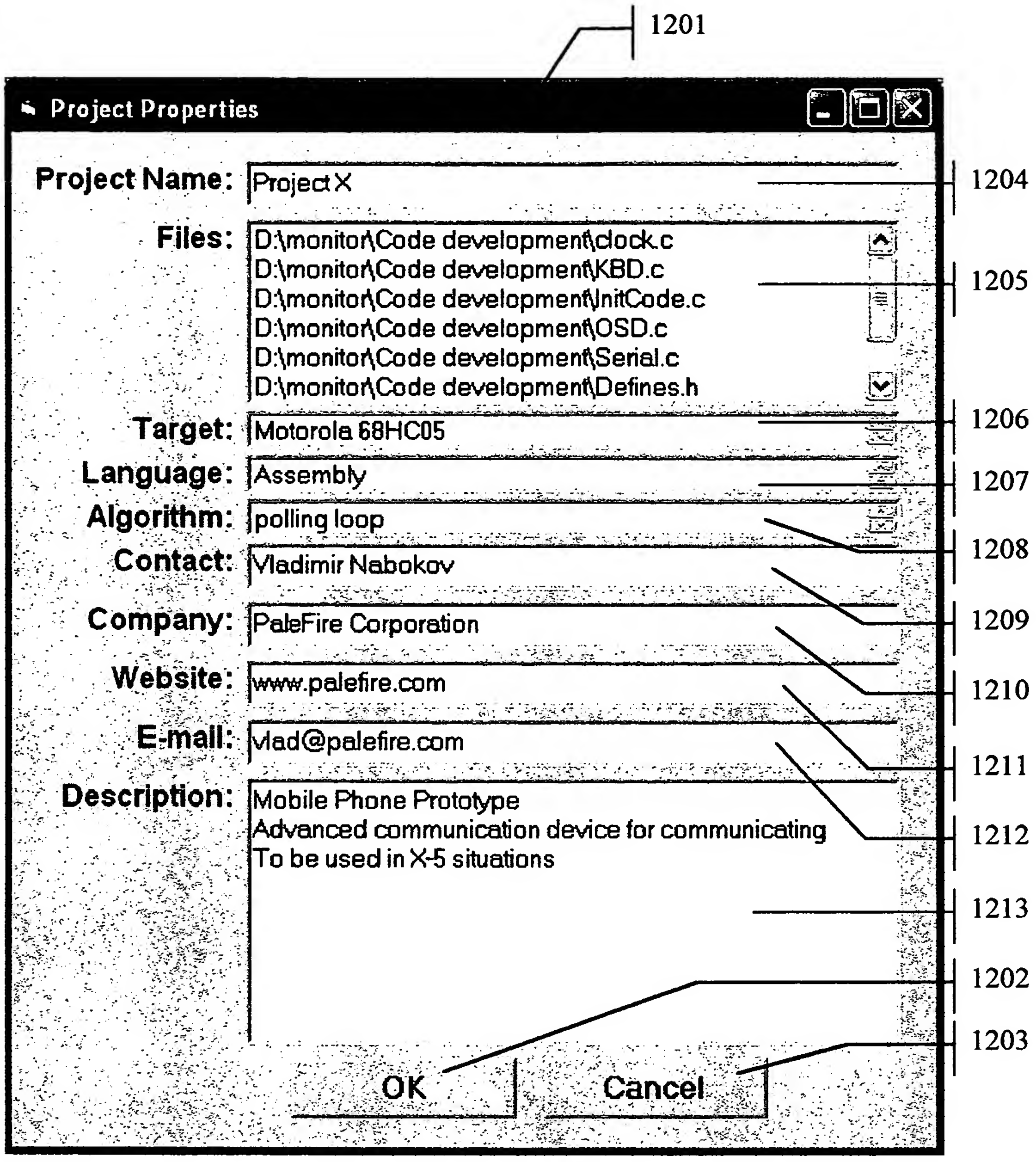

1101
TASK MANAGEMENT CODE
1102
1103
TASK A
TASK B (blocking)
Waiting for task B?
yes
no
1110
Execute code...
1111
Call blocking task B
Put new task B TCB at bottom of task B TCBQ
1112
Task B done?
no
yes
1113
Current task B TCB ID = A?
no
yes
1114
Get current task B return value
1115
Zero task state in current task B TCB
1116
Remove top TCB from task B TCBQ
1117
Continue executing code...
1118
Execute code...
1120
Update current task B TCB
1121
Task done?
no
yes
1122
Place return value in current task B TCB
1123
Place DONE task state in current task B TCB
1124

Figure 11



Project Name: ProjectX

Files: D:\monitor\Code development\clock.c
D:\monitor\Code development\KBD.c
D:\monitor\Code development\InitCode.c
D:\monitor\Code development\OSD.c
D:\monitor\Code development\Serial.c
D:\monitor\Code development\Defines.h

Target: Motorola 68HC05

Language: Assembly

Algorithm: polling loop

Contact: Vladimir Nabokov

Company: PaleFire Corporation

Website: www.palefire.com

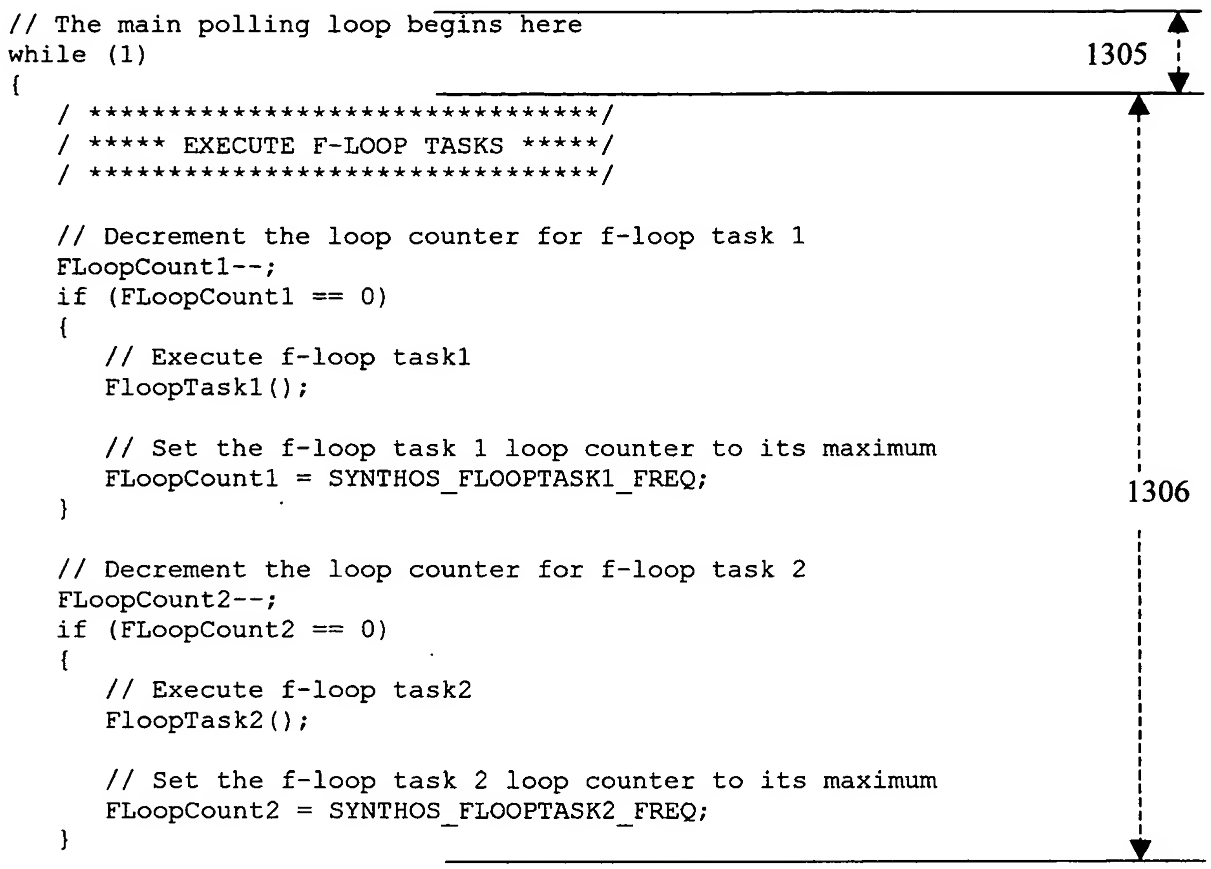
E-mail: Vlad@palefire.com

Description: Mobile Phone Prototype
Advanced communication device for communicating
To be used in X-5 situations

Figure 12

```
// SynthOS main file
// Project:        Project X
// Target:         68HC05
// Language:       C
// Contact:        Vladimir Nabokov
// Company:        PaleFire Corporation
// Website:        www.palefire.com                                1301
// Email:          vlad@palefire.com
// Date:           11/10/2001
// Time:           01:20
// Project Description:
//   Mobile Phone Prototype
//   Advanced communication device for communicating
//   To be used in X-5 situations

// Include files
#include "bsp.h"                                                  1302
#include "SynthOS_globals.h"

// The code execution begins here
main()
{                                                                 1303
   // Define local variables
   int SynthOS_task_status;     // Is a task running?
   int FLoopCount1 = 1;         // F-loop task 1 loop counter
   int FLoopCount2 = 1;         // F-loop task 2 loop counter

   / ******************************/
   / ***** EXECUTE INIT TASKS *****/
   / ******************************/                                1304
   InitTask1();
   InitTask2();
   InitTask3();
```

Figure 13a

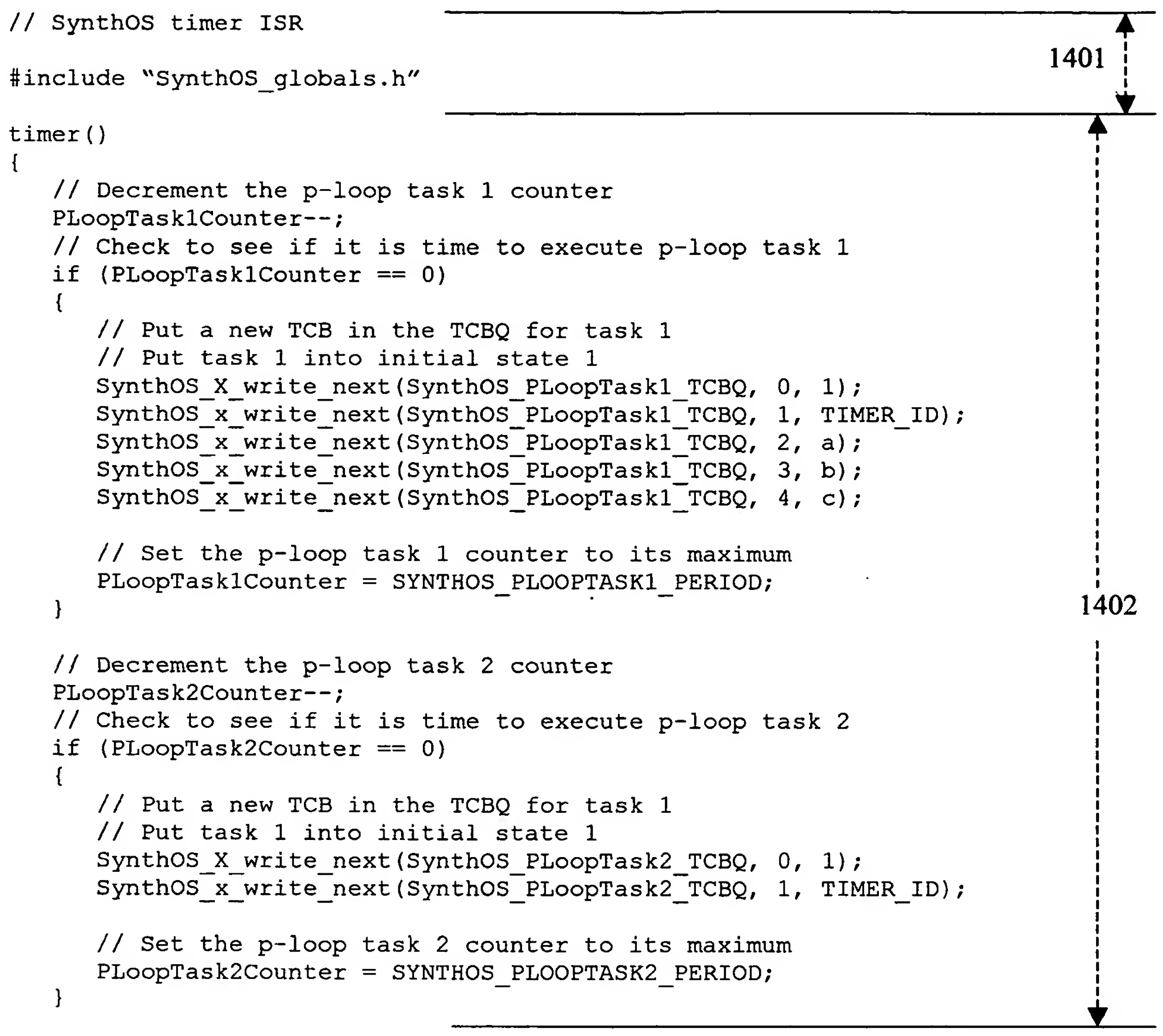


```
// The main polling loop begins here
while (1)
{
   / *******************************/
   / ***** EXECUTE F-LOOP TASKS *****/
   / *******************************/

   // Decrement the loop counter for f-loop task 1
   FLoopCount1--;
   if (FLoopCount1 == 0)
   {
      // Execute f-loop task1
      FloopTask1();

      // Set the f-loop task 1 loop counter to its maximum
      FLoopCount1 = SYNTHOS_FLOOPTASK1_FREQ;
   }

   // Decrement the loop counter for f-loop task 2
   FLoopCount2--;
   if (FLoopCount2 == 0)
   {
      // Execute f-loop task2
      FloopTask2();

      // Set the f-loop task 2 loop counter to its maximum
      FLoopCount2 = SYNTHOS_FLOOPTASK2_FREQ;
   }
```

Figure 13b

```
      / *******************************/
      / ***** EXECUTE P-LOOP TASKS *****/
      / *******************************/

      // Check status of p-loop task 1 from its TCB
      SynthOS_X_read(SynthOS_PLoopTask1_TCBQ, 0,
         SynthOS_task_status);
      // If task is not idle, execute it
      if (SynthOS_task_status != SYNTHOS_TASK_IDLE)                  1307
         PLoopTask1();

      // Check status of p-loop task 2 from its TCB
      SynthOS_X_read(SynthOS_PLoopTask2_TCBQ, 0,
         SynthOS_task_status);
      // If task is not idle, execute it
      if (SynthOS_task_status != SYNTHOS_TASK_IDLE)
         PLoopTask2();

      / *****************************/
      / ***** EXECUTE CALL TASKS *****/
      / *****************************/

      // Execute all call tasks from highest priority to lowest

      // Read the status of call task 1 from its TCB
      SynthOS_X_read(SynthOS_CallTask1_TCBQ, 0, SynthOS_task_status);   1308
      // If task is not idle, execute it
      if (SynthOS_task_status != SYNTHOS_TASK_IDLE)
         CallTask1();

      // Read the status of call task 2 from its TCB
      SynthOS_X_read(SynthOS_CallTask2_TCBQ, 0, SynthOS_task_status);
      // If task is not idle, execute it
      if (SynthOS_task_status != SYNTHOS_TASK_IDLE)
         CallTask2();
   }
}
```

Figure 13c



```
// SynthOS timer ISR

#include "SynthOS_globals.h"

timer()
{
   // Decrement the p-loop task 1 counter
   PLoopTask1Counter--;
   // Check to see if it is time to execute p-loop task 1
   if (PLoopTask1Counter == 0)
   {
      // Put a new TCB in the TCBQ for task 1
      // Put task 1 into initial state 1
      SynthOS_X_write_next(SynthOS_PLoopTask1_TCBQ, 0, 1);
      SynthOS_x_write_next(SynthOS_PLoopTask1_TCBQ, 1, TIMER_ID);
      SynthOS_x_write_next(SynthOS_PLoopTask1_TCBQ, 2, a);
      SynthOS_x_write_next(SynthOS_PLoopTask1_TCBQ, 3, b);
      SynthOS_x_write_next(SynthOS_PLoopTask1_TCBQ, 4, c);

      // Set the p-loop task 1 counter to its maximum
      PLoopTask1Counter = SYNTHOS_PLOOPTASK1_PERIOD;
   }

   // Decrement the p-loop task 2 counter
   PLoopTask2Counter--;
   // Check to see if it is time to execute p-loop task 2
   if (PLoopTask2Counter == 0)
   {
      // Put a new TCB in the TCBQ for task 1
      // Put task 1 into initial state 1
      SynthOS_X_write_next(SynthOS_PLoopTask2_TCBQ, 0, 1);
      SynthOS_x_write_next(SynthOS_PLoopTask2_TCBQ, 1, TIMER_ID);

      // Set the p-loop task 2 counter to its maximum
      PLoopTask2Counter = SYNTHOS_PLOOPTASK2_PERIOD;
   }
```

Figure 14a

```
   / *************************************/
   / ***** EXECUTE PREEMPTIVE TASKS *****/
   / *************************************/

   // Execute and pause execution of preemptive tasks

   // Decrement the timer loop counter for preemptive task 1
   PreemptiveTask1Counter--;
   // Is it time to start executing the task?
   if (PreemptiveTask1Counter == SYNTHOS_PREEMPTIVETASK1_ONTIME)
      ContextSwitchIn(PreemptiveTask1());
   // Is it time to pause executing the task?
   if (PreemptiveTask1Counter == SYNTHOS_PREEMPTIVETASK1_OFFTIME)
      ContextSwitchOut(PreemptiveTask1());
   // When counter reaches zero, reset it to its maximum
   if (PreemptiveTask1Counter == 0)
      PreemptiveTask1Counter = SYNTHOS_PREEMPTIVETASK1_MAXCOUNT;

   // Decrement the timer loop counter for preemptive task 2
   PreemptiveTask2Counter--;
   // Is it time to start executing the task?
   if (PreemptiveTask2Counter == SYNTHOS_PREEMPTIVETASK2_ONTIME)
      ContextSwitchIn(PreemptiveTask2());
   // Is it time to pause executing the task?
   if (PreemptiveTask2Counter == SYNTHOS_PREEMPTIVETASK2_OFFTIME)
      ContextSwitchOut(PreemptiveTask2());
   // When counter reaches zero, reset it to its maximum
   if (PreemptiveTask1Counter == 0)
      PreemptiveTask1Counter = SYNTHOS_PREEMPTIVETASK1_MAXCOUNT;
}
```

1403

Figure 14b